LECTURES ON ELECTRICITY AND LIGHT.

Leichtfassliche Vorlesungen über Elektrizität und Licht. By Prof. Dr. G. Jaumann. Pp. xii + 375. (Leipzig: Barth, 1902.) Price Mk. 6.

IN a book of 370 pages it is quite impossible that the subjects of magnetism, electricity and light could be treated in anything but a scrappy manner, so that we cannot expect from Prof. Jaumann anything more than a general view of the subjects treated. The book under review arose from a course of lectures at Prague for beginners at the University and teachers in the secondary schools, and is therefore of the nature of an outline to be used as a guide in study supplemented by other more technical reading. For this purpose, if there had been a good selection of references to standard treatises, the book would have been admirable; but, unfortunately, references are almost entirely absent. The author has undoubtedly made a most interesting volume and has treated the subject in a very original manner, dealing with the phenomena of magnetism, electricity and light from a physical point of view, using throughout the Faraday conception of tubes of force. The first eighty-four pages consist of an introduction dealing with stationary stream lines in the motion of a liquid to lead on to the conceptions of magnetic and electric lines of force. The analogies between liquid stream lines due to sources and sinks and vortices and lines of force due to charges and electric currents are well brought out, and considerable ingenuity is exercised in constructing cases of fluid motion to be analogous to the behaviour of lines of electric force when more than one dielectric is present in the field. It seems, however, curious to introduce, for the benefit of readers who cannot be supposed to understand lines of force, the lines of flow for a vortex filament in a steady stream as the first case of stream lines discussed. However, later on the author deals with the resultant of two sets of stream lines and shows how complicated cases can be built up out of simple cases. This might have been done at first and have led up to the more complicated and confusing cases which he presents to the reader at the very beginning. By means of a hot or cold region in the centre of a stream, he constructs stream lines which are analogous to the lines of force for a dielectric cylinder in a steady uniform electric field. The hot region is supposed to be produced by the sun shining on this part of the stream, the rest being in shadow. As a limiting case he has a region of vapour in the middle of the stream, and states in a footnote:—

> "The conditions for a stationary state of flow with a region of vapour in the middle of the stream through which the water continuously flows are left undiscussed."

This part of the book is the most interesting, but it is somewhat questionable whether the method would be really of use to a student.

The electrical and magnetic parts of the book are clearly and, on the whole, well done, in spite of the limited space at the author's disposal. The elementary parts of electrostatics are very clearly and concisely explained. There are some points which are somewhat carelessly treated—for example, it is too much to say that the process of solution of zinc in sulphuric acid is completely explained by an electrolytic decomposition due to small currents set up on the zinc producing zinc oxide and setting free hydrogen, the zinc oxide then dissolving in the acid. It is difficult to see how this is a complete explanation.

The last few pages are concerned with Röntgen, Becquerel and kathode rays. The author here is rather unfortunate, as he makes several wrong statements, *e.g.* kathode rays charge bodies on which they fall frequently with a negative, but more often with a positive charge. Also Röntgen rays are stated to be probably light rays of smaller wave-length than ultra-violet rays, and kathode rays are stated to be probably longitudinal electric waves. These statements seem extraordinary in view of the Stokes-Thomson theory of Röntgen rays and the universally accepted emission nature of kathode rays.

The illustrations are good, but sometimes superfluous—for example, on p. 270 is an illustration of a dynamo attached to a steam engine, with no description whatever in the text, and the illustrations of telescope and microscope have no accompanying description.

On the whole, the book is very interesting and would prove extremely useful to students who have already been introduced to the elementary facts of the subjects.

OUR BOOK SHELF.

The Principles of Mechanics. Part i. By Frederic Slate, Professor of Physics in the University of California. Pp. x + 299. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1900.) Price 7*s.* 6*d.* net.

A Treatise on Elementary Dynamics. By H. A. Roberts, M.A. Pp. xi + 258. (London: Macmillan and Co., Ltd., 1900.) Price 4*s.* 6*d.*

AN interesting contrast can be made between these two little treatises on the methods of mathematical instruction in this country and America.

The English book is still full of elegant little calculus-dodging expedients, and no differential coefficient is allowed to appear, as it is intended for candidates for mathematical scholarships, who are still kept marking time so long over coordinate geometry as never to arrive at the calculus.

The American professor, on the other hand, addresses a class of college students of about the same age, but who have brought to their task a working knowledge of the calculus, as well as a good groundwork of experimental physics. This knowledge of experimental facts will enable the student to follow Prof. Slate's somewhat metaphysical presentation of the subject. Mr. Roberts has also incorporated the views of modern writers on the laws of motion, based mainly on Mach's "Science of Mechanics." This will make these treatises useful to students who are to become teachers in their turn; but Prof. Perry will say that they are unsuitable for the class of student he has in his mind, as the exercises and illustrations are throughout of the usual academic type, devoid of reality, or else based on microphysical conceptions.

Studien ü. d. Milchsaft v. Schleimsaft der Pflanzen. Von Prof. Dr. Hans Molisch. Pp. viii + 109. (Jena: Gustav Fischer, 1901.)

PROF. MOLISCH gives a general account of the occurrence of laticiferous tissue and mucilage cells in plants, treating his subject specially from the point of view of the latex itself. He finds that the fluid is commonly acid or sometimes neutral in reaction, thus differing in this respect from protoplasm. He finds a curious form of vesiculated nucleus to be of common occurrence, and

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describes the protein granules (first detected by H. Karsten), starch, oil, alkaloids and other contents in a number of examples. The protein granules are stated to arise (*e.g.* in *Cecropia*) inside special leucoplast-like structures, and elaioplasts are said to occur in the latex of croton. Of inorganic substances, calcium and magnesium are very often met with, but phosphorus, though present in the ash, is not apparently present except in organic compounds.

The mucilage cells and their contents are also discussed, and the author describes an apparently new substance, which he terms "luteofilin," as occurring extensively in monocotyledons and also in the Lobeliaceæ. A brief account of the aloin receptacles which are found in *Aloë soccotrina*, and some of the reactions and properties of their contents ends the volume.

Cast Iron: a Record of Original Research. By William J. Keep. Pp. xv + 225; with 117 illustrations. (New York: John Wiley and Sons. London: Chapman and Hall, Ltd., 1902.) Price 10*s.* 6*d.*

THIS volume possesses the distinction, which is yearly becoming less rare, of containing an account of original researches which are directly applicable to industrial work. Mr. Keep has devoted himself to the study of cast iron since 1885, and from time to time has expressed decided opinions regarding the best methods to be employed in foundries. In particular he has advocated the use of tests by which the amount of shrinkage during solidification is ascertained, his contention being that the quality of the metal to be tapped may thus be determined.

On p. v. a summary of the whole subject is given, so that a busy founder can in five minutes learn the practical results of Mr. Keep's teaching. In order to apply these results in practice, it is desirable also to read pp. 155 to 191, but the remainder of the book consists chiefly of the evidence on which the value of the recommendations rests, and is of interest only to those with a taste for science and a desire to understand what they are doing. The shrinkage test gives information mainly as to the percentage of silicon present, an addition of silicon being accompanied by a reduction in the shrinkage, and silicon, the author points out, acting through carbon, is the controlling element in cast iron.

Those founders who have not followed the course of scientific investigation on cast iron of late years would be well advised to study Mr. Keep's book, even if they do not agree with all that he says.

Test Papers in General Knowledge. By H. S. Cooke, M.A. Pp. vi + 97. (London: Macmillan and Co., Ltd., 1902). Price 1*s.* 6*d.*

THE author of this book has essayed a difficult task, and one cannot be surprised that he has achieved only a qualified success. The papers (eighty-five in number) are all short—too short, perhaps—but certainly do not lack variety. The work is intended for use in higher classes of primary schools, secondary schools and pupil teachers' "centres"; and the author's suggestion as to the use of the book is, "Each student should be provided with a copy, and a test (or more) should be given to the class one week, the answers of which should be returned the following week; this would give a fair opportunity of research in books of reference." There is much to be said in favour of such a plan. It may be doubted, however, if some of the knowledge which the students are thus set to obtain is of sufficient value to justify any expenditure of time on the attainment thereof. It is not easy to see, for example, what useful purpose is served by causing a youth to ascertain the length of time a letter would take to go from London to Moscow, or the cost of sending a parcel about two pounds weight to Winnipeg, or the price of a 100*l.* share in the Great Western Railway. Nor is much gained by knowing who wrote certain books unless something is also known of their nature, contents, and purpose. Are any of the pupils for whom the work is intended sufficiently grounded in scientific method to answer such questions as, "How did the teaching of Aristotle differ from that of Bacon?" or can any be expected to "compile (*sic*) a simple form of a Will?" It is only fair to the author to say that many questions are really admirable, *e.g.* "What results in history may be traceable to the discovery of the New World?" Scientific subjects, too, are, on the whole, well treated, and much useful knowledge must result from the efforts to answer thoroughly the questions asked. The general character of the papers, however, is hardly satisfactory from an educational point of view. Too much is made of mere knowledge and too little of the ability to use it. Hence one fears that they will ultimately prove tests of memory rather than of observation and resource, and that instead of "stimulating a many-sided *interest* in the facts of everyday life," the author will produce an irritating *curiosity* which grows on what it feeds. May we suggest a thorough revision? The book is worth it. Not only so, but in its present state there are many badly-worded questions and some few serious errors. We may attribute "in statu pupillar*ii*" and "Carmen Sylv*ia*" to careless proof reading; but the inaccuracies in the quotations in papers xi. and xxix. (to select two only) are quite unpardonable.

Class Book of Geology. By Sir Archibald Geikie. Fourth edition. Pp. xxi + 454. (London: Macmillan and Co., Ltd., 1902.) Price 5*s.*

SIR ARCHIBALD GEIKIE'S class-book of geology is likely to be one of those which will survive in the struggle for existence among the numerous handbooks of the subject which have been lately issued. There are many ways of accounting for the frequent appearance of new text-books. One of them, though perhaps not the principal one, is to be found in the varied requirements of pupils and teachers, and when an elementary work has run to a fourth edition, as in this case, we may fairly assume that it has met a want.

It is not easy to write a good text-book. This arises sometimes from the difficulty of observing a due sense of proportion all through, notwithstanding that the author is vastly more interested in some branches of the subject than in others, while sometimes it arises from the necessity of bringing before the student many subjects which are still matters of controversy, and the author has either to make positive statements in accordance with what he thinks the best supported theory or delicately to hint that doubts exist.

One reason why this class-book has been so successful is that Sir Archibald has covered all the most important parts of the subject without distracting the reader with controversy. In this he was, of course, much helped by the existence of his larger work, the "Text-Book," to which more advanced students can be referred.

The most important alterations in this edition are the introduction of descriptions and explanations of the phenomena of tectonic geology, for which his illustrations have been drawn chiefly from America, where these branches of the subject have been followed up with so much zeal and skill, and where recent travel has enabled Sir Archibald to examine the evidence and discuss the interpretation of the phenomena on the spot with his scientific friends on the other side of the Atlantic.

May he long enjoy the leisure he has so well earned, and still employ it in keeping his valuable educational and descriptive works up to date.

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